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(71) Applicant(s)
**Reckitt Benckiser (UK) Limited**
**(Incorporated in the United Kingdom)**
**67 Alma Road, WINDSOR, Berkshire, SL4 3HD, United Kingdom**

**University of Southampton**
**(Incorporated in the United Kingdom)**
**Highfield, SOUTHAMPTON, SO17 1BJ, United Kingdom**

(72) Inventor(s)
**Malcolm Tom McKechnie**
**John Farrell Hughes**
**Karen Louise Jerrim**

(74) Agent and/or Address for Service
**Elizabeth A Dickson**
**Reckitt Benckiser plc, Group Patents Departments, Dansom Lane, HULL, HU8 7DS, United Kingdom**

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(56) Documents Cited
**GB 2327596 A**
**WO 94/06295 A**
**WO 99/08722 A**
**US 6086853 A**

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**Online: EPODOC, JAPIO, WPI**

(54) Abstract Title

**Method for deactivating dust mite allergens comprising burning a candle which comprises tea tree oil or one or more monocyclic terpenes**

(57) A method for deactivating a Der-p allergen comprises burning in a space to be treated a candle comprising a deactivating amount of a volatile oil selected from cajeput oil (tea tree oil) or an oil comprising one or more monocyclic terpene hydrocarbons (such as pinol or commercial formulations containing limoene, cineole or terpinolene).

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# FIGURE 1

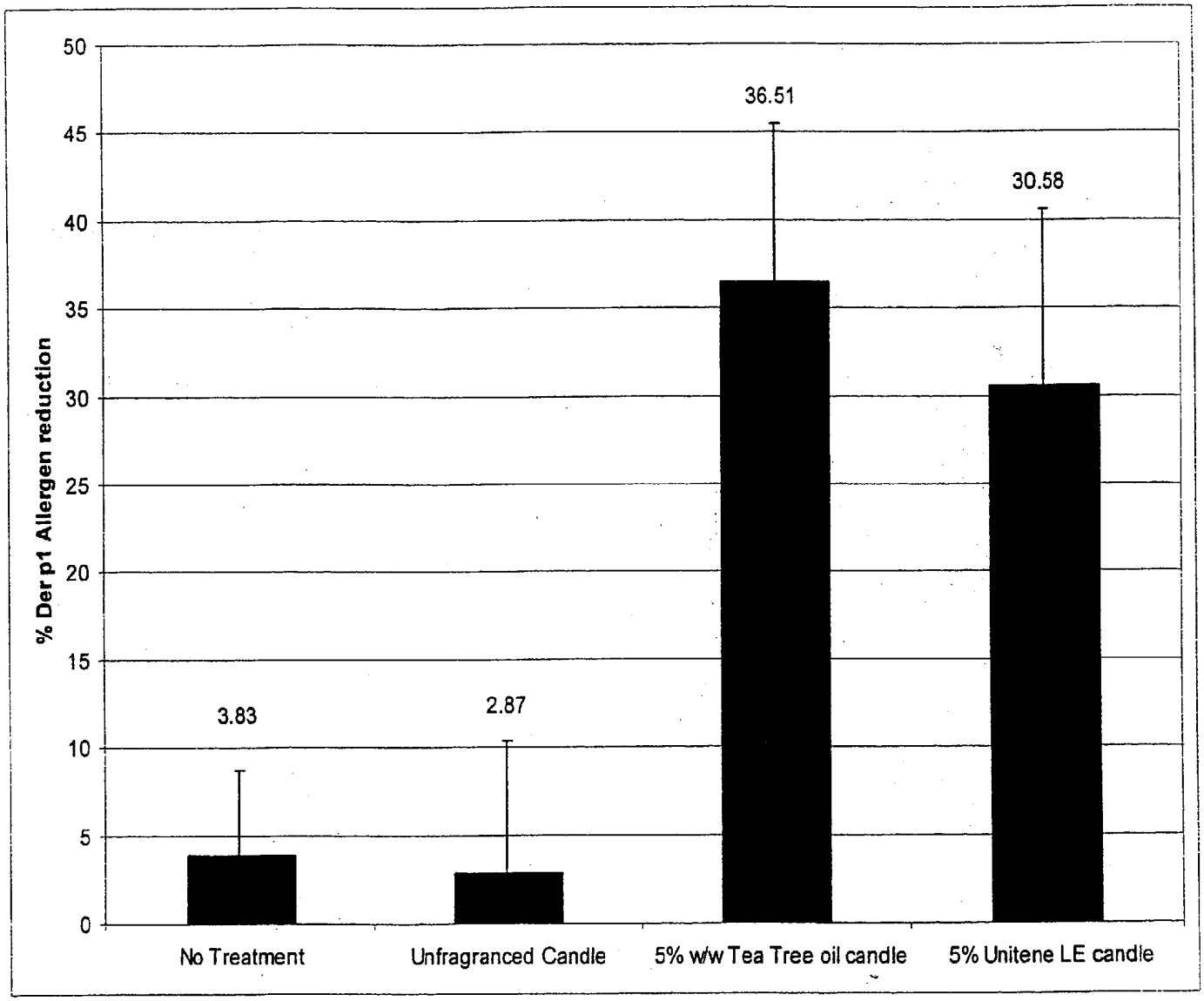


**Figure 1: The effect of burning candles containing 5% essential oil for 5 hours in 28m$^3$ rooms on Der p1 allergen concentration in house dust samples. ( 6 replicates, standard errors shown)**

# FIGURE 2

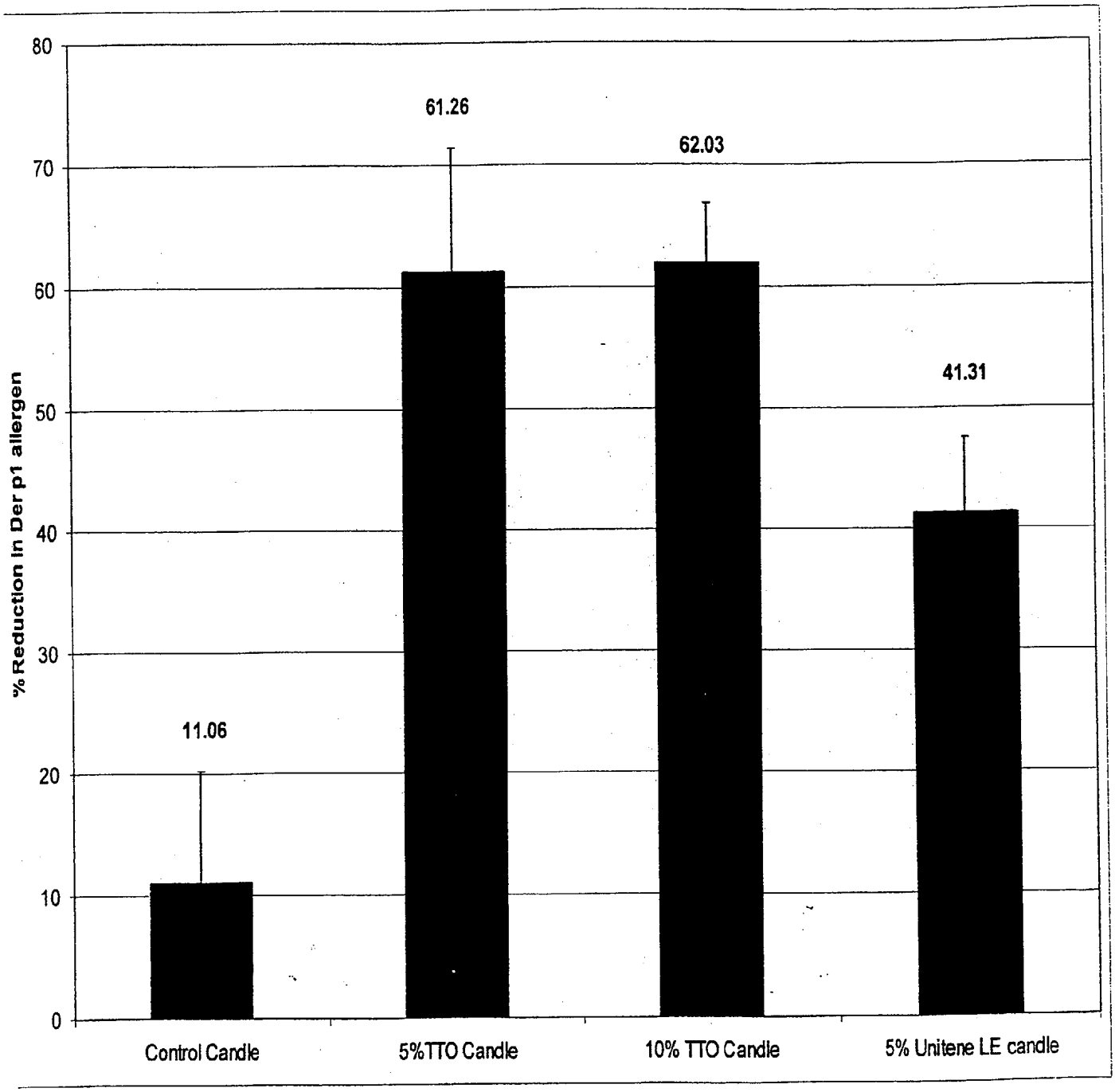


**Figure 2 : The effect of a 5 hour burn of candles containing 0, 5 or 10% Tea Tree Oil or 5% Unitene LE on Der p1 allergen concentration in dust in small (0.49m$^3$) booths. (6 Replicates, standard errors shown)**

# METHOD FOR DEACTIVATING DUST MITE ALLERGENS

The present invention relates to a method for deactivating dust mite allergens.

Various allergens are known which are transported through the air to trigger a human reaction. For example, it has been known for a long time that house dust can trigger allergenic reactions in humans, such as asthma and rhinitis. It was reported, as early as 1928 that it was the dust mites in the dust that were the primary source of the allergenic response, but it was only in the 1960's that researchers appreciated its significance.

It is believed that the faeces of the house dust mite, *Dermatophogoides farinae* (known as Der-f) and *Dermatophagoides pteronyssinus* (known as Der-p) trigger the immune response of the body, thereby giving rise to well known allergenic symptoms. A review of this is given in Experimental and Applied Acarology, 10 (1991) p. 167-186.

One way to overcome these allergenic responses has been to vacuum clean surfaces, such as carpets, that contain the dust mites and their faeces throughly and often, but that is both time consuming (it has to be regularly done to ensure an allergenic free environment) and is very dependant on the efficiency of the vacuum cleaner and filter bag used, e.g. micron filter bags or two layer vacuum bags.

An alternative method of creating an allergen-free environment has been to denature the allergen, for example, by using an allergen denaturant applied to airborne allergens by means of an aerosol spray device, for example as described in PCT/GB99/01976. Such a device produces an aerosol spray when activated and this spray may be targeted at any space which is to be treated.

The allergens to be treated are airborne

particles and the use of a known aerosol spray device results in a low collision rate between the allergen denaturant and the airborne allergens. The practical consequence of such a low collision rate is that the allergen denaturant must be used in a high amount in order to be effective. There may be other consequences such as, in the case where the aerosol spray composition includes a perfume or fragrance, a strong perfume smell or a limited fragrance choice.

PCT/GB98/02863 describes a method for deactivating allergens derived from the Der-f and/or Der-p dust mite species, which comprises contacting the allergen with a deactivating amount of one or more of a variety of 28 deactivants as described. The deactivants which are specified for use include cedarwood oil, hinoki oil and thymol (6-isopropyl-m-cresol).

We have now discovered that the house dust mite Der-p allergen can be denatured by burning candles containing certain natural oils to deactivate the allergens.

Accordingly, the present invention provides a method for deactivating a Der-p allergen which comprises burning in a space to be treated a candle comprising a deactivating amount of a volatile oil selected from cajeput oil (tea tree oil) or an oil comprising one or more monocyclic terpene hydrocarbons.

Suitable oils comprising one or more terpene hydrocarbons which may be used in the present invention are those which are generically referred to as pinol such as these sold under the names Unitene D® and Unitene LE® (Bush Boake Allen). The main component of both Unitene D and Unitene LE comprise limonene as their major constituent. Unitene D contains significant quantities of cineole and terpinolene, whilst Unitene LE contains significant

quantities of terpene alcohols.

Cajeput oil, which is generally known as tea tree oil, is obtained from the Melaleuca leucandra, Melalecua quinquenervia or other Melaleuca species. The main components of tea tree oil are cineole and terpinene-4-ol.

In carrying out the method of the present invention the candle which is burnt will generally comprise at least 2% by weight of the volatile oil, preferably at least 5% by weight of the volatile oil and more preferably at least 10% by weight of the volatile oil.

By the term "candle" as used herein is meant a solid, semi-solid or gelled body of a combustible material which contains an axially embedded combustible fibrous wick. When the wick of a candle is lit, the heat so generated melts the combustible material and the resulting liquid flows up the wick by capillary action and is combusted.

Typically, the combustible body of the candle may be a blend of organic materials such as beeswax, paraffin wax, montan wax, carnauba wax, microcrystalline wax, fatty alcohols, fatty acids, fatty esters or natural and synthetic resins. Clear candles may comprise as the combustible material a gel comprising mineral oil containing blends of diblock and triblock copolymers based on synthetic thermoplastic rubbers or a gel obtained by combining a liquid base material of a hydrogenated polyolefin, a gelling agent and optionally a gel enhancing agent.

A wick normally extends longitudinally through the candle body. More than one wick may be used, if desired, but usually a single wick is centrally disposed in the candle body. When a candle wick is ignited, the wick is adapted to burn gradually so that both the wick and the candle body are consumed.

Typically, the weight of candle which is burnt in

a particular space to be treated will depend upon the actual volume of the space, e.g. room, to be treated. An appropriate allergen denaturing effect can be obtained in accordance with the method of the invention by burning in a room of volume 25 to 30$m^3$ a candle of weight approximately 150g before testing containing 5% by weight of the volatile oil for a period of 5 hours. The amount of the volatile oil which is released from the burning candle can be calculated by weighing the candle at 1 hour intervals.

The length of time for which the candle is burnt in the space to be treated will generally be for up to 5 hours although in some circumstances the candle may be burnt for a longer period of time, such as 10 hours or more. However, it will be understood by those skilled in the art that an allergen denaturing effect will be obtained even if the candles containing the selected volatile oils are burnt for a lesser period of time.

The present invention will be further described with reference to the following Example.

**EXAMPLE 1**

**Method**

The tests were completed in 28$m^3$ test rooms with no windows and a door that was closed throughout the duration of the test. The rooms did not contain any furniture and had easily cleaned floors of non-reactive resin. Six test areas 0.7 x 0.7m were marked out on the floor of each room with tape. Each test area was divided into two halves. Test dust had been obtained from household vacuum cleaner bags. House dust was passed through a number of sieves and the fraction smaller than 53 microns was collected. 0.1g of dust was placed in a small sieve to distribute it evenly over the test surface. The dust was applied by

moving the sieve continuously over the surface. Dust was removed from half of each of the 6 test areas by suction of 20l/min through an in-line glass fibre filter (2.5cm diameter) and the weight recorded. These were the pre-treatment controls. The selected test candles of approximately 150g before testing were lit and placed in the rooms for 5 hours. The candles were then smothered and the dust was left exposed in the rooms for 16 hours. The dust was then collected as for the controls and weighed.

The collected samples were assayed by Der p1 ELISA to determine the allergen content. This was then related to the weight of dust that had been present in each sample. All the samples were multiplied up to compare the amount of allergen expected to be present in a 0.1g sample of dust. The percentage differences between the control samples and the exposed samples were then obtained and presented in Figure 1.

During the 5 hour burn period approximately 27g of each of the candles was burnt. For candles B and C detailed below this equated to a release rate of 270µl of essential oil per hour.

Tests completed were:

**Test Description**

A Unfragranced candle, room relative humidity (rh)

B 5% w/w Tea Tree oil candle, room rh

C 5% w/w Unitene LE candle, room rh

M No Treatment, room rh

The room rh recorded during the tests was between 50 and 57%.

**Results**

It can be seen from Figure 1 that there is a significant reduction ($P<0.05$) Der p1 allergen content

of dust exposed to both the Tea Tree Oil (36.5%) and Unitene LE (30.6%) candle as compared to the no treatment control (t= 3.19 and 2.38 respectively).

**Discussion**

The results indicate that a significant reduction in allergen can be achieved in a room environment by burning candles containing either Tea Tree Oil or Unitene LE for 5 hours.

**EXAMPLE 2**

Tests were carried out in small booths each equipped with a 3cm diameter opening to allow a small amount of air to enter the booth to assist in burning candles of approximately 150g before testing. The candles contained 5% or 10% of the volatile oils and the release rate of essential oils in these tests are given below.

**Mean weight of candle lost in 5 hour burn**

| Candle type | Mean weight of candle lost during 5 hour test (g) | Standard Error (only shown for those with 6 replicates) |
|---|---|---|
| Control candle | 17.6 | |
| 5% Tea Tree Oil candle | 8.38 | 0.74 |
| 5% Pinol (Unitene LE) candle | 10.35 | 3.97 |
| 10% Tea Tree Oil candle | 9.73 | 0.7 |

**Average weight of candle and essential oil lost per hour**

| Candle type | Mean weight of candle lost during 1 hour test (g) | Mean volume of essential oil released during 1 hour ($\mu$l) |
|---|---|---|
| Control candle | 3.52 | 0 |
| 5% Tea Tree Oil candle | 1.68 | 84 |
| 5% Pinol (Unitene LE) candle | 2.07 | 104 |
| 10% Tea Tree Oil candle | 1.95 | 195 |

House dust was passed through a number of sieves and the fraction smaller than 53 microns was collected. 0.1g of dust was placed in a small sieve to distribute it evenly over the test surface. The test surface was an aluminium tray 0.6m x 1m, which can be easily cleaned with strong detergent. The dust was applied to the tray by moving the sieve continuously over the surface. Half of the dust was then removed by suction of 20L/min through an in-line glass fibre filter (2.5cm diameter) and the weight recorded. This was the pre-treatment control. The tray was then placed in a plastic booth 1 x 0.7m x 0.7m.

The candle to be tested was weighed and placed in the booth. The candle was lit and the booth door closed. After approximately 2 hours the temperature and humidity in the booth were measured; the candle was allowed to burn for a total of 5 hours. The candle was then smoothered and the dust was left exposed in the booth for 17 hours. The tray was then removed and the booth ventilated. The dust was vacuumed from the tray onto a filter and weighed. The candle was weighed and the amount of weight lost recorded.

Test candles evaluated were:
Control candle
5% Tea Tree Oil candle
10% Tea Tree Oil candle
5% Pinol (Unitene LE) candle
Six replicates were completed for each candle. The collected samples were assayed by Der pl ELISA to determine the allergen content. This was then related to the weight of dust that had been present in each sample. All the samples were multiplied up to compare the amount of allergen expectd to be present in a 0.1g sample of dust. The percentage difference between the control sample and the exposed sample was then obtained and is presented in Figure 2.

**CLAIMS:**

1. A method for deactivating a Der-p allergen which comprises burning in a space to be treated a candle comprising a deactivating amount of a volatile oil selected from cajeput oil (tea tree oil) or an oil comprising one or more monocyclic terpene hydrocarbons.

2. A method as claimed in claim 1 wherein the candle which is burnt comprises at least 5% by weight of the volatile oil.

3. A method as claimed in claim 2 wherein the candle comprises at least 10% by weight of the volatile oil.

4. A method as claimed in claim 1 or claim 2 wherein the candle is burnt for 10 hours or more.

5. A method as claimed in any one of the preceding claims wherein the oil comprising one or more terpene hydrocarbons is a pinol.

INVESTOR IN PEOPLE

**Application No:** GB 0024018.4 **Examiner:** Stephen Quick
**Claims searched:** 1-5 **Date of search:** 28 March 2001

# Patents Act 1977
# Search Report under Section 17

## Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S):

Int Cl (Ed.7): A01N; A61L 9/00

Other: Online: EPODOC, JAPIO, WPI

## Documents considered to be relevant:

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| A | GB 2327596 A | (K R C HARRIS), use of tea tree oil in the deactivation/denaturation of dust mite allergen | - |
| A | WO 99/08722 A1 | (S C JOHNSON & SON), see examples I-VII (pages 11-15) | - |
| A | WO 94/06295 A1 | (INTERNATIONAL FLAVORS & FRAGRANCES), see examples I & II, pages 83-85 (candles containing geraniol & citronellol oil) | - |
| A | US 6086853 A | (ROBERT S MICHAELS), medicinal candle containing camphor & menthol | - |

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|---|---|---|---|
| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention. |
| & | Member of the same patent family | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |